

# A System for Planning Ahead

A software system that uses artificial intelligence (AI) techniques to help with complex Space Shuttle scheduling at NASA's Kennedy Space Center is now commercially available to private industry. Stottler Henke Associates, Inc. (SHAI), of San Mateo, California, is marketing its automatic scheduling system, known at Kennedy as the Automated Manifest Planner (AMP), to industries that must plan and project changes many different times before the tasks are executed. The system creates optimal schedules while reducing manpower costs.

Planning and scheduling NASA Space Shuttle missions is no small task. The complex, knowledge-intensive process, begun anywhere from 5 to 10 years prior to a launch, requires the expertise of experienced mission planners. Some of the many factors that the long-term plans must reflect include the resources required, constraints, work shift requirements, intervals between launches, and maintenance issues.

In order to ease some of this workload, Kennedy granted a **Small Business Innovation Research (SBIR)** contract to SHAI in 1992 to develop a system to automate and maintain the long-term Shuttle processing schedule known as the "mission manifest." The resulting AMP product enables expert Shuttle schedulers to input their knowledge to create a working automatic scheduling system. In contrast, personnel unfamiliar with long-term scheduling can maintain the system without the years of training that were previously required to handle such a task. For the past 8 years, AMP has been maintaining the mission manifest, performing advanced scheduling studies, and producing manifest reports for all NASA field centers on a daily basis. Kennedy also uses AMP to schedule the short- and long-term external tank/solid rocket booster processing in a much faster and more accurate manner than the previous manual process.

*The Automated Manifest Planner makes scheduling decisions based upon resource limitations and other constraints.*

End-users find that AMP is readily adaptable. Using information entered into the system by expert planners, the system automatically makes scheduling decisions based upon resource limitations and other constraints. It provides a constraint authoring system for adding other constraints to the scheduling process as needed. An extremely flexible and user-friendly tool, AMP plans orders of magnitude faster than existing tools. One user reported performing over 100 planning studies in a year, a task that would have been impossible without AMP.

AMP is also adaptable to assist with a variety of complex scheduling problems in manufacturing, transportation, business, architecture, and construction. In cases where scheduling different pieces of equipment that work together impacts rates and costs, AMP can be particularly helpful. This type of scheduling is common in vehicle assembly plants, batch processing plants, semiconductor manufacturing, printing and textiles, surface and underground mining operations, and maintenance shops.

For most of SHAI's commercial sales, the company obtains a service contract to customize AMP to a specific domain and then issues the customer a user license. Current commercial sales of the product total \$400,000, exceeding NASA's SBIR investment. ♦

